Code No: **R201124** **R20** **SET - 1**

I B. Tech I Semester Supplementary Examinations, July/August-2023

ENGINEERING MECHANICS

(Common to Auto E, Min E)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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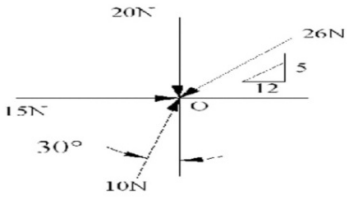
UNIT-I

1. a) Determine the magnitude and the direction of the resultant of forces acting at 'O' as shown in figure [7M]



b) Find dot product and cross product of the following vectors: P = i+ 2j -3k and Q = 4i -5j +6k [7M]

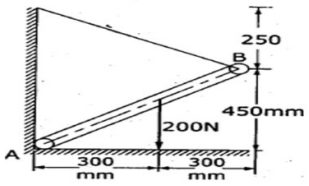
(OR)

2. a) A uniform ladder of length 10m and weighing 20N is placed against a smooth vertical wall with its lower end 8m from the wall. In this position the ladder is just to slip. Determine [7M]
a) The coefficient of friction between the ladder and the floor
b) Frictional force acting on the ladder at the point of contact between ladder and floor.

b) A force vector of magnitude 40N, is directed from A(1,4) to B(6,7). Determine [7M]
   i) The components of the force along x,y axes.
   ii) ii) Angles with x and y axes
   iii) iii) Specify the force vector.

UNIT-II

3. a) A rod AB of weight 200 N is supported by a cable BD and the corner of wall and floor surface as shown in fig. Find the reaction at A and tension in the cord. [7M]



b) A force vector F has the components Fx = 150N, Fy= -200N and Fx = 300N. Determine the magnitude F and the angle made by the force with coordinate axes. [7M]

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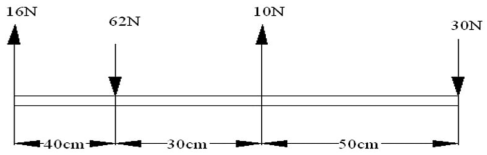
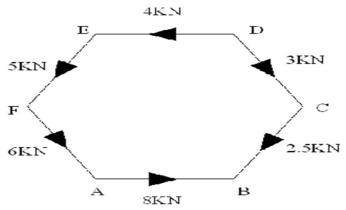
(OR)

4. a) A rigid bar is subjected to a system of parallel forces as shown in figure. Reduce this system to [7M]
   i) Single force
   ii) A single force moment system at A
   iii) A single force moment system at B.

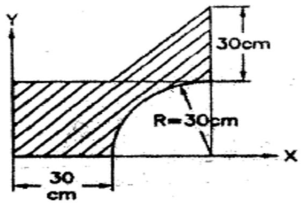


   b) Forces acting on the Hexagon ABCDEF of side 40cm is shown in figure. Determine the Net moment about A. [7M]

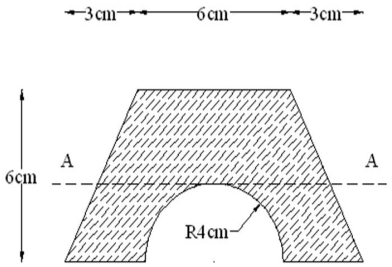


UNIT-III

5. a) Determine the coordinates of centroid of the shaded area shown in figure. [7M]

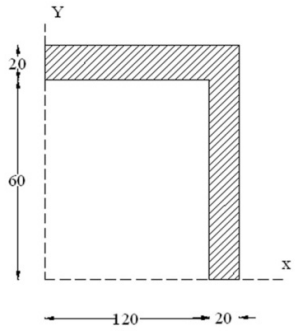


   b) The cross-section of a culvert is shown in figure. Compute the moment of inertia about the horizontal A-A axis. [7M]



(OR)

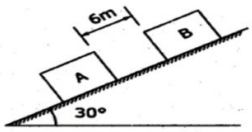
6. a) Determine the product of inertia of the sectioned area about the x-y axes shown in figure. [7M]



b) A Cylinder of height of 10 cm and radius of base 4 cm is placed under sphere of radius 4 cm such that they have a common vertical axis. If both of them are made of the same material, locate the centre of gravity of the combined unit. [7M]

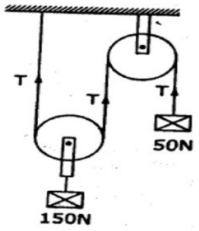
UNIT-IV

7. Two Blocks A and B of weight 100 N and 200 N respectively are initially at rest on a 30° inclined plane as shown in figure. The distance between the blocks is 6 m. The co efficient of friction between the block A and the plane is 0.25 and that between the block B and the plane is 0.15. If they are released at the same time, in what time the upper block (B) reaches the Block (A). [14M]



(OR)

8. a) Two blocks of weight 150N and 50N are connected by a string, passing over a frictionless pulley as shown in fig. Determine the velocity of 150N block after 4 seconds. Also calculate the tension in the string. [7M]



b) State the law of conservation of energy. Give the proof of this law taking mechanical energy only into account. [7M]

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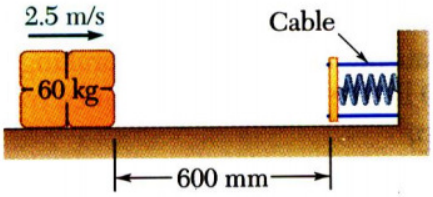
UNIT-V

9.. A spring is used to stop a 60 kg package which is sliding on a horizontal surface. The spring has a constant k = 20 kN/m and is held by cables so that it is initially compressed 120 mm. The package has a velocity of 2.5 m/s in the position shown and the maximum deflection of the spring is 40 mm. Determine (a) the coefficient of kinetic friction between the package and surface and (b) the velocity of the package as it passes again through the position shown. [14M]



(OR)

10. Explain Work Energy method by considering an example. [14M]

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